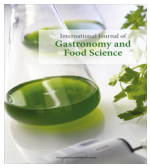

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Editorial

# Foreword from the editors

*By José Andrés*

Not too long ago, there was a time when what we learned at culinary school, or in a kitchen, was based on old traditions. Cooking techniques were shared through word of mouth or taken from complicated textbooks, and more often than not, their understandings were many years behind what was actually happening. Roasting, frying, boiling, cold and hot emulsions, browning, canning, and so much more, were being used without anyone really having a clue as to why. Repetition, and improving them, was the only way forward. And as we advanced, the small achievements made on the culinary front happened through centuries of trial and error.

I still remember a day back in April of '88, when I was working at the meat station at Ferran Adrià's elBulli. I had a small pot of oil where I was frying beet, artichoke, and sweet potato chips. On another station nearby, someone was making a gelatin of almond milk.

Ferran walked over to the gelatin and grabbed a spoon. He tasted it a couple of times and then observed the spoon of gelatin for so long, and so closely, everyone in the room had panicked, rounded eyes. Then he walked over to my pot of oil. He looked at it for a few seconds, and then looked back at the gelatin. Staring at each pot, he had a look that could reach deep into the heart of earth.

At that moment, I felt like I had many times before: like I could read his mind. In times like these, I often wondered if he was letting himself be read by others. My thoughts turned to the gelatin and the hot oil.

Oh, no! Is he really thinking about doing that?

All of the sudden, he grabbed the gelatin and walked over to my pot of oil. My fears were about to become true. He was about to throw a spoon full of the gelatin into the hot oil! Everyone in the kitchen looked at each other and silently asked, what is he doing? Did he not know that gelatin only holds its solid state under cold conditions? Did he not know that oil and water do not really like each other? And that their relationship was even more toxic when heat was involved?

My love for cooking, and my need to understand "the why" of things, began on that day, more than 20 years ago. The seed was planted. Throughout my career, my team and I have not just been cooking, we have been learning while we cook. Not just learning about what we are cooking and how we cook it, but also "the why" behind what happens when we do.

That tradition has to be respected is nonnegotiable. But that does not mean we cannot be challenging what we know and building upon our knowledge. My need to know "the why" led me to learn more about food and science, and food history, and food politics, and food as national security, and nutrition, and hunger and obesity. Food is so interconnected, and understanding that will give us the opportunity to change the world through the power of food. To know more is a powerful tool, and knowledge, especially when it comes to scientific-based knowledge, has been and will continue to be a revolution in the food movement.

Ever since I was young, every paycheck has gone to a meal at a restaurant or on cookbooks, especially old cookbooks. I am also a lover of "latas" or canned goods, which Spain happens to be one of the best producers of, in quantity and especially quality. So, as you can imagine, the day I got my hands on a first edition of Nicolas Appert's The Art of Preserving All Kinds of Animal and Vegetable Substances for Several Years, printed in 1810, was a good one for me. Fifteen years before that book was printed, Napoleon Bonaparte offered 12,000 francs to whoever could create a new way to preserve food to help feed his army. And it was Appert who, after years of research, won that prize with his invention of canning. Many years had to pass for anyone to understand that this method, originally called aperture in honor of its inventor, worked so well because a vacuum-sealed environment prevented bacteria to grow. Nevertheless, a new scientific way to preserve food was created, changing the food industry forever and leading to many more inventions that would help us to preserve foods.

It was an incredible step forward for the scientific research of food, but still, with some 805 million people hungry today and with over 1 billion tons of food that we produce going to waste, I do not think we are following in Appert's footsteps well enough. We need to use science and technology to our advantage. Have it play a bigger role in saving the goodness of the earth, to give the right tools and expertise to people around

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the world so that no crop will go to waste, and food will feed all.

But an even bigger problem than wasting the food itself, and one that we all seem to be blind to, is the technology to cook it. This is where the scientific community can, and will, make a difference.

Around the world, people feed themselves using whatever fuels they have at their disposal. For some, this means cooking with charcoal for a barbecue over the weekend, but for the rest of the week, they are most likely lighting a stove within seconds in order to put dinner on the table. But for too many, three billion to be exact, this means three rocks on the floor of their kitchen and an open fire for every single meal, the same method our ancestors used over a thousand centuries ago.

For these people, the evolutions in cooking have not taken place. Mothers and small children are getting sick from the fumes created with this fire. Young girls and boys are spending all of their time in the forests to collect wood, missing their childhood, and an education, and putting themselves in harm's way to feed these lethal fires. This way of cooking is affecting their environment, too, and in countries like Haiti, that means 98 percent of its land is victim to deforestation. Without the trees, the rains that are supposed to mean life become death, because they pour down the hills and wash away farmland, preventing crops to grow and pushing all of the soil into the sea, where it harms the reefs and coral and marine life and wipes out an entire fishing industry.

This circle of death closes with the fact that this fuel, that is killing them and their environment, costs as much as 30–50 percent of their income. Could you imagine being able to buy food to feed your family when you are spending that much just on the fuel you need to cook it?

But our future looks bright. Because we have science, and we have research. Many people are working on more efficient solutions for cookstoves, like solar and natural gas. Science will provide the answer.

Ferran's almond gelatin experiment exploded that day back at elbulli. Just as we all thought it would. But he did do something right, because moments before he threw the gelatin in, he said to me "If I don't test it, I won't know." He applied trial and error, and did not base his actions on theory. Even though it did not work out at first, he kept trying, and what he wanted to create, the liquid croquette, eventually came into this world when he figured out that a thin sheet of pasta and some breading would protect the gelatin from the hot oil. And that is why Ferran Adrià, and his brother Albert, are considered such important contributors to science, because of their scientific approach to cooking.

In my first edition of Matthieu Williams' The Chemistry of Cookery from 1891, he writes in the preface, "I was surprised at the strange neglect of the subject by modern chemists." That subject was the chemistry of cooking. Let us not let this neglect continue, by making sure the chefs and all of the food people around the world know "the why," the relationship between science and cooking. Because that is what gastronomy is, and it is the difference between an average restaurant and a three-star Michelin one. But even more important, it is the difference between being able to feed an entire planet one day or not.

*By Bruno Goussault*

My thanks to Andoni Luis Aduritz for opening the pages of his superb and interesting journal, Science and Gastronomy, to give me the opportunity to explain the work my collaborators and I have been doing for many years in the world of Gastronomy. Since 1970, we have been contributing to the development of precise-temperature cooking thanks to the technique of sous-vide cooking. This technique revolutionized the world of cooking. Basically, to cook at exact temperature it is necessary to cook in water, and indeed water is the best cold- and heat-transfer fluid and the easiest to regulate to the nearest tenth of a degree. But in order to cook in water, one has to protect the food against leaching of colors, textures, tastes, and aromatic substances, all the while promoting heat transfer. For that we use plastics, films, or sachets, which are chosen for their compatibility with the food products and we shape them into a skin using vacuum-forming techniques. These old-as-time cooking techniques have therefore been modernized to let us access the exact right temperature to obtain surprising sensory results, at the far reaches of biochemistry and microbiology.

Today everyone is talking about low temperature, but we have to escape this concept which is dragging us constantly further down into the world of food insecurity. No, there really exists an exact cooking temperature for each food product which lets us simultaneously optimize its organoleptic potential and also destroy vegetative forms of pathogenic bacteria. One then has to block the germination of the spore forming bacteria by preserving the food using cold methods.

But for us, the most important thing has been to define the concept of cooking. For CREA, cooking occurs when the functional properties of the components of the food products are being modified.

Therein lies the answer to some simple questions: can you cook a product in liquid nitrogen? Is ceviche a cooked product? In truth, only heat can fundamentally modify functional properties of component of food products, for example, the physical or physicochemical properties, which have an effect on the sensory behavior of the components of food. Why do the organoleptic desires of consumers not translate into modification objectives of functional properties for chefs? A rare, tender and juicy steak that has good color does not require a recipe, only the skills of the chef. To approach gastronomic cuisine by relying on the analysis and development of the functional properties of the components of products has allowed us to avoid the use of chemicals and additives in recipes and to develop a more natural cuisine and healthier products. Why use mono-glycerides, ultra-filtered proteins or lecithins in vegetable juices to make them frothy, when all that is required is to increase the level of polysaccharides, a natural frothing agent for vegetable juices which works by simple freeze concentration? This technique increases the concentration of dry matter in the juice and amplifies the functional potential of the components that are naturally present in vegetable juices.

José Andrés, Bruno Goussault